ISOLATION OF *MICROSPORUM DISTORTUM* FROM ANIMALS IN THE UNITED STATES*

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While studying the dermatophytes of the Otago district of New Zealand, di Menna and Marples (1) encountered a dermatophyte that formed irregularly shaped, thick-walled, echinulate macroconidia (Fig. 2D). The fungus was considered to be a new species of *Microsporum* and it was named *Microsporum distortum*. Di Menna and Marples recovered this dermatophyte from twelve human cases of ringworm. Nine of the twelve isolates came from cases of tinea capitis of children below the age of puberty, two from tinea corporis of children, and one from tinea corporis of an adult. Ten of the infected individuals resided in rural areas, one lived in the urban area of Dunedin, and the home of the twelfth was not determined.

The epidemiologic features of these outbreaks suggested to the New Zealand workers that animals were the source of the human infections. Because nearly all the patients resided in rural areas, these workers postulated that either farm or feral animals were involved, rather than household pets. However, they did not demonstrate that lower animals were the source of the human infections.

The present paper records the isolation of *M. distortum* from lower animals. In all but one case recoveries were made from pet monkeys. This is the first time that *M. distortum* has been reported from the United States. All laboratory work was done by the Mycology Laboratory, Communicable Disease Center, Chamblee, Georgia.

CASE REPORTS

Case 1. In the latter part of January, 1956, a resident of Des Moines, Iowa, purchased from a local pet shop a 3-month-old capuchin monkey (*Cebus sp*). A few days after the animal was brought home, the owner noticed the animal to be scratching itself. This observation was reported to the pet dealer, who prescribed the addition of vitamins to the monkey's diet. The itching continued, and on March 9, 1956, the owner took the pet to a local veterinarian§ for diagnosis and treatment of the condition. At that time the animal showed a generalized scaliness of the skin, accompanied by a patchy loss of hair (Fig. 1). The veterinarian suspected the dermatosis to be of fungal origin and submitted hair and skin scrapings from the monkey to the Mycology Laboratory of the Communicable Disease Center, Chamblee, Georgia, for examination. The fungus *M. distortum* was recovered from this specimen.

Case 2. The same owner had a 2-year-old Boston terrier bitch that gave birth to three

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Received for publication October 31, 1956.

FIG. 1. Skin lesion on right forearm of monkey, showing loss of hair and scaliness

puppies on March 1, 1956. On April 3rd, all four dogs manifested cutaneous lesions suggestive of ringworm. The puppies developed numerous circular scaly areas of alopecia on their heads and extremities. The dam showed a single, dry, scaly patch of alopecia on her head. Clinical material collected from the bitch by the public health veterinarian* was submitted to this laboratory for mycologic examination. The dermatophyte *M. distortum* was isolated from this specimen.

During the later part of March, 1956, both the owner, age 38, and his daughter, 16 years old, developed skin lesions on their necks and arms. The mother, age 36, was apparently normal. On the basis of clinical appearance, the human lesions were diagnosed by a local physician as being ringworm. No laboratory work was carried out on the human cases to determine the etiologic agent.

Case 3. During the latter part of March, 1956, another resident of Des Moines, Iowa purchased a 4-month-old, male capuchin monkey from the same pet shop. Shortly after this animal was brought home, the owner noticed a scaly patch of alopecia on the simian's head. The condition was observed to spread, and on April 14, 1956, the monkey was presented to a local veterinarian† for diagnosis and treatment of the dermatosis. At that time the pet evidenced varying degrees of alopecia and scaliness over the entire body. Hairs and skin scrapings obtained from the monkey were submitted by the veterinarian to this laboratory for examination. *M. distortum* was recovered from this material.

At the time the monkey was brought to the veterinarian, the owner, age 46, had lesions on her face and arms. The lesions were circular in outline with erythematous borders and dry, scaly centers. The owner did not seek medical care, and treated herself with a pro-

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prietary fungicidal preparation. No clinical material from the human lesion was available for mycologic study.

Case 4. On April 23, 1956, a third resident of Des Moines, Iowa, purchased a 3-month-old male capuchin monkey from the same dealer. When this pet was brought home, the owner noticed scaliness of the skin over the head, back, and legs of the monkey. The simian was taken to a local veterinarian,* who submitted hair and skin scrapings collected from this monkey to this laboratory for mycologic examination. *M. distortum* was recovered from this specimen. To date, there have been no human cases in the owner's household as a result of contact with this animal.

Case 5. On April 19, 1956, a resident of Dalton, Georgia, while traveling through Florida, purchased a 7-month-old, male spider monkey (*Ateles sp*), from a pet dealer. At the time of the purchase the prospective owner noticed a single scaly patch of alopecia on one of the monkey's legs. After the animal was brought home, he was observed to scratch constantly. Over a period of one month, patches of alopecia appeared all over the monkey's body. On March 19, 1956, the owner's wife, age 29, developed a circular plaque with an erythematous border, on one of her arms. A few days later, similar lesions appeared on the owner's two young daughters. One girl, 5 years of age, developed plaques on her arms and legs. The other child, 2 years old, had lesions on her back. The owner himself was not affected. A local physician examined the members of the family, and on the basis of clinical appearance diagnosed the lesions as being ringworm.

On May 5, 1956, the monkey was presented to a local veterinarian* for diagnosis and treatment of the dermatosis. The veterinarian found multiple scaly, erythematous patches of alopecia distributed over the entire animal's body. A clinical diagnosis of ringworm was made, and specimens collected from the affected areas were submitted to this laboratory. *M. distortum* was recovered from this specimen.

MYCOLOGIC IDENTIFICATION

At the laboratory, the clinical materials submitted from each of the five animals were examined under the Wood's light. In Case 1, involving a monkey, infected hairs were found to emit a greenish fluorescence similar to that frequently observed in hairs infected by *M. canis* and *M. audouinii*. In all five cases, direct microscopic examination of the infected hairs revealed an ectothrix mosaic of small spores (2–3 u). Multiple cultures were made from the clinical materials by employing the selective isolation medium developed by Georg *et al.* (2, 3). In 7 days, colonies, approximately 15 mm in diameter, were observed to form in each case. The colonies were uniform in character, their topography was irregular, and they had a tendency to form radial grooves with age. The surface texture was variable in different parts of the colony. Some areas showed a flattened velvety growth, while other areas were quite fluffy (Fig. 2A). Surface pigments varied from cream to tan. The reverse of the colony developed a dull yellowish-tan pigmentation. On microscopic examination numerous microconidia and macroconidia were found. The macroconidia were thick-walled, rough, and distorted in shape. They varied in size from 4–14 u in width and from 3–40 u in length. The microconidia were pear-shaped, borne "en thyrses", and ranged in size from 2–4 u in width and from 3–6 u in length (Fig. 2B, C). Favic chandeliers, nodular bodies and chlamydospores were also present. Growth on rice medium (4) was good. On this medium the colonies were tan in color, and formed abundant aerial mycelium. Microscopically the growth was identical with that of the

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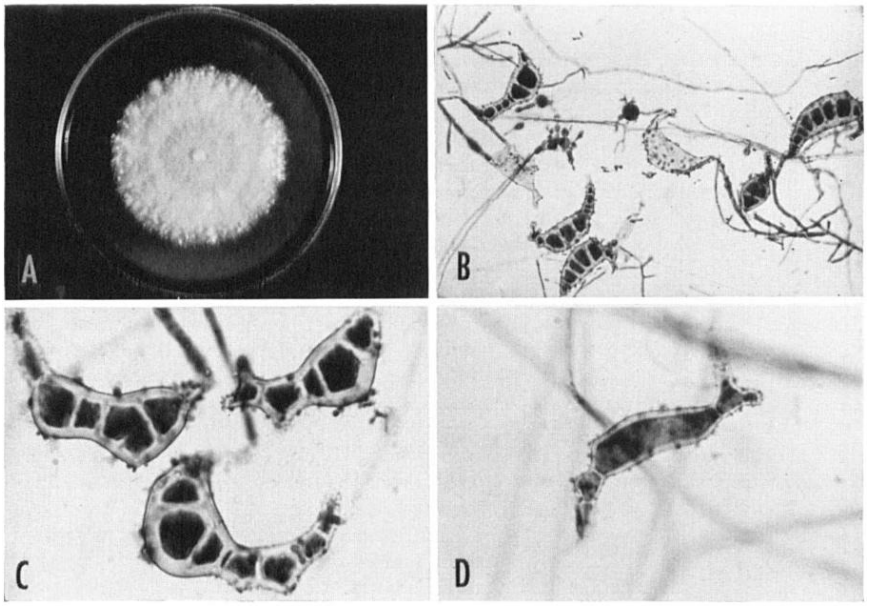

FIG. 2A. Gross appearance of *M. distortum* on Sabouraud dextrose agar. 2B. Microscopic appearance of *M. distortum* on Sabouraud dextrose agar, showing macroconidia and microconidia. 2C. Macroconidia of *M. distortum*, showing distorted shapes and thick, rough walls. 2D. Macroconidium of an *M. distortum* strain isolated by di Menna and Marples in New Zealand.

colonies cultivated on Sabouraud's dextrose agar. On the basis of these findings, the isolates were identified as *M. distortum*.

DISCUSSION

Di Menna and Marples (1) have shown that *M. distortum* is pathogenic for man under natural conditions. They also demonstrated the pathogenicity of this fungus for laboratory animals (rat, guinea pig, rabbit, and cat) by experimental inoculation studies. The present paper reports recoveries of this dermatophyte from four pet monkeys and a dog. It is shown that the dog contracted the disease from an infected simian. In addition presumptive evidence is presented which indicates that the infected monkeys transmitted the disease to human contacts. These facts demonstrate the capacity of *M. distortum* to parasitize a variety of mammalian species. This ability, together with the apparent ease of spread from one host to another, points to the possibility of its widespread establishment in the animal population of this country. The public health and economic implications of such an occurrence are apparent. Since the lesions produced by *M. distortum* are not clinically distinguishable from that caused by other dermatophytes, cultural studies of human and animal ringworm cases are essential for the detection and control of this infection.

How does one explain the presence of *M. distortum* in the United States? One

possibility is that the dermatophyte was brought into this country from a foreign land. In four of the five case reports presented, an infected simian was involved. In three cases capuchin monkeys were implicated and in one instance a spider monkey. These are new world simians, indigenous to Central and South America. All three capuchins were purchased from a single pet shop in Des Moines, Iowa. Upon inquiry, the owner of this establishment reported that he had obtained the animals from a dealer in St. Louis, Missouri who in turn disclosed that some of his stock were imported directly from a dealer in Managua, Nicaragua, and some were bought from American supply houses. It was difficult to determine whether the three capuchin monkeys involved were part of a shipment that had originated in Nicaragua. However, as far as could be established, it appeared that the capuchins in cases 2 and 3 were imported from that country. With reference to the infected spider monkey (case 4), the Florida dealer disclosed that the animal had been imported from Costa Rica.

While conclusive proof has not been obtained to show that *M. distortum* was brought into this country by monkeys imported from Central America, the evidence is sufficiently suggestive to warrant further investigation into this possible avenue of origin. Such investigations must include cultural studies of appropriate clinical materials collected from new world monkeys at the point of arrival into the United States. A clinical examination alone would not be sufficient.

SUMMARY

The isolation of *Microsporum distortum* from four pet monkeys and 1 dog is reported. This is the first time that this dermatophyte has been reported from the United States. The mycologic findings, clinical appearance, and significance of these cases are presented.

REFERENCES

1. Di Menna, M. and Marples, M. J.: *Microsporum distortum* Sp. Nov. from New Zealand. Tr. Brit. Mycol. Soc., **37:** 372–374, 1954.
2. Georg, L. K.: Use of a cycloheximide medium for isolation of dermatophytes from clinical materials. Arch. Dermat. & Syph., **67:** 355–361, 1953.
3. Georg, L. K., Ajello, L. and Papageorge, C.: Use of cycloheximide in the selective isolation of fungi pathogenic to man. J. Lab. & Clin. Med., **44:** 422–428, 1954.
4. Conant, N. F.: Studies in the genus *Microsporum*: I. Cultural studies. Arch. Dermat. & Syph., **33:** 665–683, 1936.